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10/552,731	11/15/2005	**Tadahiro Ohmi**	039262-0142	9459

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EXAMINER	
WHITESELL GORDON, STEVEN H	
ART UNIT	**PAPER NUMBER**
2851	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/552,731	OHMI ET AL.	
	Examiner	Art Unit	
	Steven Hunt Whitesell-Gordon	2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) ____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 October 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/11/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Acknowledgment is made of Preliminary Amendment made 11 October 2005. Claim 29 is newly added.

2. Acknowledgement is made of WO 2002/041196, JP 2003-332221 and JP 2003-15309 and the corresponding documents in each respective family which was cited in PCT international search report as an "X" reference dated 7 September 2004.

Priority

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Objections

4. Claims 7 and 13 are objected to because of the following informalities:

a. Claim 7, line 2, "inclduding" should be rewritten as --including--, in order to correct spelling.

b. Claim 13 line 4, "average ed" should be rewritten as --averaged--, because in order to correct spelling.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 1-7, 10, 16-19, 21, 28 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Mei [US 2002/0097495].

For claim 1, Mei teaches a pattern writing system comprising a substrate 42, a pattern projecting apparatus using light control elements arranged two-dimensionally (DMD or SLM) and a micro lens array 154 to thereby project onto said substrate 42 a pattern in the form of an aggregate of a large number of spots (exposure grid on subject 42, see Figs. 8 and 12), and means for relatively moving said substrate (scans with motor 52, which scans subject 42, see Fig. 2) with respect to said pattern projecting apparatus, characterized in that pattern writing is performed so that said substrate 42 is moved obliquely (by angle θ, see Figs. 8, 9 and 12) with respect to an array 154 of said large number of spots forming the pattern projected (see Figs. 8, 11 and 12), whereby some of the spots included in said patterns caused by irradiation at different times overlap with each other at the same position on said substrate 42 (see Figs. 4, 10-11, and14).

For claim 2, Mei teaches spots each have a polygonal shape (square shown in Fig. 4, 8 and 10).

For claim 3, Mei teaches an intensity of irradiation of each spot has an intermediate gradation by one-time irradiation and a required intensity is achieved when the spots are irradiated to overlap with each other a predetermined number of times on the same position on said substrate 42 (exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14).

For claim 4, Mei teaches a pattern writing method for projecting an aggregate pattern of spots arranged in a matrix (exposure grid on subject 42, see Figs. 8 and 12)

onto a substrate 42 by relatively moving one of said aggregate pattern of the spots and said substrate 42 in a predetermined moving direction (stage scanned in direction 136 by scanning motor and pixel panel moved in one direction by panel motor and see [0050]), said pattern writing method characterized by the steps of: rendering rows or columns of said aggregate pattern of the spots into an oblique state with respect to the predetermined moving direction (exposed rows and columns at angle θ, see Figs. 8, 9 and 12) and; performing pattern writing by moving said one of said aggregate pattern of the spots and said substrate 42 in said predetermined moving direction, with the oblique state kept intact (maintaining oblique state during scan, see Figs. 8 and 12).

For claim 5, Mei teaches the spots forming said aggregate pattern of the spots are projected to the same positions on said substrate a plurality of times during movement of said substrate in said predetermined moving direction (multiple exposures over a particular spot, see Figs. 4, 10 and 14).

For claim 6, Mei teaches the spots projected to the same positions on said substrate the plurality of times are provided by light control elements that are ON/OFF controlled (see [0037], [0067], [0073] and [0080]).

For claim 7, Mei teaches a pattern writing method for writing a pattern on a substrate 42 by introducing exposure light incident from a light source 32 onto a mirror device DMD including micro mirrors arranged two-dimensionally (DMD with 600x800 pixels, see [0031]) and by using a projection pattern output from said mirror device, said pattern writing method characterized by: directly projecting or reduction-projecting projection patterns output from said mirror device (see Figs. 2, 19-25) and; overlapping

the projection patterns with each other a plurality of times over the substantially whole surface of a pattern projection area on said substrate 42 so as to perform exposure (exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14).

For claim 10, Mei teaches a pattern writing system characterized by comprising a mirror device including micro mirrors arranged two-dimensionally (DMD with 600x800 pixels, see [0031]), a light source for supplying exposure light to said mirror device, a substrate 42 for mask pattern writing, a moving mechanism 52 for moving said substrate in X- and Y-directions (see [0054]-[0060]), means for directly projecting or reduction-projecting projection patterns output from said mirror device onto said substrate (see Figs. 2 and 19-25), and control means 36 for overlapping said projection patterns a plurality of times over the substantially whole surface of a pattern projection area on said substrate to thereby perform exposure (with control system 36, see Fig. 2 and [0030], [0032], [0047] and [0077]).

For claim 16, Mei teaches overlapping is accomplished by repeating a step of performing exposure by moving said substrate 42 in an X-direction by part of an X-directional length (length of offset, see [0058]) determined for said projection pattern and then performing exposure by further moving said substrate in said X-direction by said part of the length (see [0054]-[0060]).

For claim 17, Mei teaches after movement of said substrate in said X-direction is finished, said overlapping is performed by repeating a step of performing exposure by moving said substrate in a Y-direction by part of a Y-directional length (y offset, see

[0054]) determined for said projection pattern so that the projection patterns partly overlap also in said Y-direction and then a step of performing exposure by further moving said substrate in said X-direction by said part of the length (see [0054]-[0060]).

For claim 18, Mei teaches a pattern writing method for writing a pattern on a substrate 42 by the use of a projection pattern output from a mirror device (DMD with 600x800 pixels, see [0031]), said pattern writing method characterized by performing writing in intermediate gradations by partly overlapping patterns written on said substrate 42 to thereby perform exposure (exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14).

For claim 19, Mei teaches a pattern writing method for writing a pattern on a substrate 42 by the use of a projection pattern that is obtained by introducing pulsed exposure light (shuttering or strobing of light source 32, see [0048]) from a pulse light source onto a mirror device (DMD with 600x800 pixels, see [0031]) including micro mirrors arranged two-dimensionally and by being output from the mirror device, said pattern writing method characterized by the steps of directly projecting or reduction-projecting projection patterns output from said mirror device so as to overlap with each other a plurality of times over the substantially whole surface of a pattern projection area on said substrate 42 to thereby perform exposure (exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14) and, on the basis of energy values of said pulse exposure light (energy according to percentage of exposure, can be exposure time or intensity, see

[0034], [0037] and [0038]), controlling the number of overlapping times of said pulsed exposure light that exposes an area (with control system 36, see Fig. 2 and [0030], [0032], [0047] and [0077]) on which each of said micro mirrors is illuminated in said pattern projecting area on said substrate (see Figs. 8,12 and 14).

For claim 21, Mei teaches a pattern writing method for receiving pulsed exposure light from a pulse light source (shuttering or strobing of light source 32, see [0048]) at a mirror device including micro mirrors arranged two-dimensionally (DMD with 600x800 pixels, see [0031]) and writing a pattern on a substrate 42 by the use of a projection pattern output from said mirror device (see Figs. 2, 19-25), said pattern writing method characterized by partly overlapping projection patterns output from said mirror device in a pattern projection area on said substrate to thereby perform exposure a plurality of times (exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14) and reproducing a gray scale based on the number of overlapping times of said exposure light (energy according to percentage of exposure, can be exposure time or intensity, see [0034], [0037] and [0038]).

For claim 28, Mei teaches a pattern writing method for receiving exposure light from a light source 32 at a mirror device including micro mirrors arranged two-dimensionally (DMD with 600x800 pixels, see [0031]) and writing a pattern on a substrate 42 by the use of a projection pattern of the individual micro mirrors output from said mirror device , said pattern writing method characterized by partly overlapping projection patterns from said mirror device at least in a one-dimensional direction

(exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14) with the lapse of time to thereby realize a gray scale (energy according to percentage of exposure, can be exposure time or intensity, see [0034], [0037], [0038] and [0048]).

For claim 29, Mei teaches means for averaging said output lights and supplying the average light to said mirror device/devices comprises a beam splitter 362 (see Figs. 19-23).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 8, 9, 11, 12, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mei in view of Ceglio et al. [US 5,691,541].

For claims 8, 9, 11 and 12, Mei teaches the pattern writing system disclosed in claims 7 and 10 above, and further incorporates Ceglio by reference (see [0004]).

Mei does not appear to explicitly disclose a wavelength-conversion solid-state laser or a microwave-excited excimer laser is used as said light source or the second harmonic of a solid-state laser or a copper vapor laser is used as said light source and said projection light is subjected to wavelength conversion and is projected onto said substrate.

Ceglio teaches a wavelength-conversion solid-state laser (see col. 5 lines 3-7) or a microwave-excited excimer laser is used as said light source or the second harmonic of a solid-state laser or a copper vapor laser (see col. 5 lines 3-7) is used as said light source and said projection light is subjected to wavelength conversion (see col. 5 lines 3-7) and is projected onto said substrate.

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the copper vapor laser or wavelength-conversion solid-state laser as taught by Ceglio in the pattern writing system and method as taught by Mei, because such lasers as taught by Ceglio would provide for pulsing of the exposure light beam that would allow for maintaining a high velocity of the substrate stage in order to increase substrate throughput.

For claims 23 and 24, Mei teaches a pattern writing system including a pulse light generating portion (shuttering or strobing of light source 32, see [0048]) and two-dimensionally arranged micro mirrors (DMD with 600x800 pixels, see [0031]) and reduction-projecting said micro mirrors onto a substrate (see Fig. 11), said pattern writing system characterized by comprising means for generating pulse light (shuttering or strobing of light source 32, see [0048]) and means for performing pattern transfer while overlapping (exposing an area by overlapping with multiple partial exposures, see [0037], [0038] Figs. 4 and 10 and 14), in both of two perpendicular moving directions (see [0054]-[0060]) on said substrate 42, projection patterns of said two-dimensionally arranged micro mirrors, each projected onto said substrate 42 by one-time pulse light (see Figs. 8 and 12).

While Mei teaches using a mercury lamp that provides collimated light and further discloses the use of excimer laser with incorporated reference to Ceglio, Mei does not appear to explicitly disclose using a laser.

Ceglio teaches using lasers to expose a photoresist, (see Fig. 1 and col. 3 lines 20-35)

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the lasers as taught by Ceglio in the pattern writing system and method as taught by Mei, because such lasers as taught by Ceglio would provide for pulsing of the exposure light beam that would allow for maintaining a high velocity of the substrate stage in order to increase substrate throughput, and would also provide a beam of radiation within the UV range in order to expose the photoresist.

9. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mei in view of Ceglio as applied to claim 11 above, and further in view of Mead et al. [US 2002/0000426].

For claims 13-15, Mei teaches a pattern writing system with a plurality of mirror devices between the exposure beam and the substrate (see [0031]) and Ceglio teaches a wavelength-conversion solid-state laser (see col. 5 lines 3-7), but Mei in view of Ceglio do not appear to explicitly disclose a plurality of lasers and a means for averaging output lights output from at least two lasers with a beam splitter.

Mead teaches a plurality of said solid-state lasers (1105 and 1107, see Fig. 11 and [0028]) and further comprising means for averaging at least two of said plurality of

solid-state lasers comprises a beam splitter 1113 (see Fig. 11 and [0039]) and supplying the averaged light to a system between the laser and the substrate.

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the plurality of lasers and averaging beam splitter as taught by Mead in the pattern writing system taught by Mei in view of Ceglio, because, as taught by Mead in [0040], this would allow for exposing two different locations on a same substrate, increasing the speed by which the substrate can be exposed and increasing throughput.

10. Claims 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mei in view of MacAulay et al. [US 2003/0002040].

For claims 20 and 22, Mei teaches a pattern writing system for receiving pulsed exposure light from a pulse light source (shuttering or strobing of light source 32, see [0048]) at a mirror device including micro mirrors (DMD with 600x800 pixels, see [0031]) arranged two-dimensionally and writing a pattern on a substrate 42 by the use of a projection pattern output from said mirror device, partly overlapping projection patterns output from said mirror device in a pattern projection area on said substrate to thereby perform exposure a plurality of times (exposing an area by overlapping with multiple partial exposures until 100% exposure is accomplished, see [0037], [0038] Figs. 4 and 10 and 14) and reproducing a gray scale based on the number of overlapping times of said exposure light (energy according to percentage of exposure, can be exposure time or intensity, see [0034], [0037] and [0038]) and light control elements that are ON/OFF controlled (see [0037], [0067], [0073] and [0080]).

Mei does not appear to explicitly disclose a detection means for detecting energy values of said pulse exposure light and a correction device for correcting energy variation in exposure light based on a detection result detected by said detection means and that controls said micro mirrors forming said mirror device based on a calculation result.

MacAulay teaches a detection means 37 for detecting energy values of said pulse exposure light 4 and a correction device (device that corrects variant intensities, see [0090]) for correcting energy variation in exposure light 4 based on a detection result detected by said detection means and that controls said micro mirrors 34 forming said mirror device based on a calculation result (see [0090]).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the detection means and correction means as taught by MacAulay in the pattern writing system as taught by Mei, because this would allow for accurate measurement of the light intensity in order to confirm the appropriate exposure intensity and determine the appropriate exposure time for exposing the overlapping regions of the substrate.

11. Claim 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mei in view of Ceglio as applied to claim 24 above, and further in view of Toshiyuki et al. [US 6,233,035].

For claim 25, Mei teaches a pattern writing system with pulse light applied to a micro mirror device followed by a grating 152 (see Fig. 11 and 0063) to further shape

the light, but does not appear to explicitly teach a pinhole plate that can divide, into a large number of fine light beams.

Toshiyuki teaches a pinhole plate 15 that can divide, into a large number of fine light beams (see Fig. 5).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the pinhole plate as taught by Toshiyuki in the pattern writing device as taught by Mei in view of Ceglio, because, also taught by Toshiyuki in col. 6 lines 64-67, the addition of the pinholes can increase the depth of focus and reduce the numerical aperture of the pattern writing system, in order to decrease defocus.

12. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mei in view of Ceglio, in view of Toshiyuki as applied to claim 25 above, and further in view of Watkins et al. [US 2003/0027367].

For claim 26, Mei in view of Ceglio, in view of Toshiyuki teaches a pattern writing system that has a pinhole plate, but does appear to explicitly teach the pinhole plate comprises a quartz glass and a metal film formed on a surface of said quartz glass, said metal film exposed in the shape of holes by the use of an electron-beam exposure system.

Watkins teaches the pinhole plate comprises a quartz glass and a metal film formed on a surface of said quartz glass, said metal film exposed in the shape of holes by the use of an electron-beam exposure system (see [0037]).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the pinhole plate made with quartz and metal as taught by Watkins in the pattern writing system that has a pinhole plate as taught by Mei in view of Ceglio, in view of Toshiyuki, because the quartz can be transmissive to UV while the metal chrome can be reflective, therefore, allowing for the formation of pinholes in the metal chrome on the surface of the quartz could allow for an increase the depth of force and reduce the numerical aperture of the pattern writing system, in order to decrease defocus.

13. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mei in view of Ceglio, in view of Toshiyuki, in view of Watkins as applied to claim 26 above, and further in view of Ohtsuka et al [US 6,049,555].

Mei in view of Ceglio, in view of Toshiyuki, in view of Watkins teaches a pattern writing system that has a pinhole plate made of quartz and metal, but does not appear to teach the pinhole plate has a Peltier element.

Ohtsuka teaches pinhole plate 18 has a Peltier element 22 (plate cooled holder 21, see Fig. 1).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the Peltier element as taught by Ohtsuka in the pattern writing system as taught Mei in view of Ceglio, in view of Toshiyuki, in view of Watkins, because the radiation impinging the surface of the pinhole plate can increase the temperature of the pinhole plate varying the shape of the pinholes and causing

distortion in the beam, the Peltier element could control the temperature of the pinhole plate in order to reduce variations in the pinholes.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Hunt Whitesell-Gordon whose telephone number is (571)270-3942. The examiner can normally be reached on Monday to Thursday, 9:00 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on 571-272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SHW/
9/4/2008

/Diane I Lee/
Supervisory Patent Examiner, Art Unit 2851